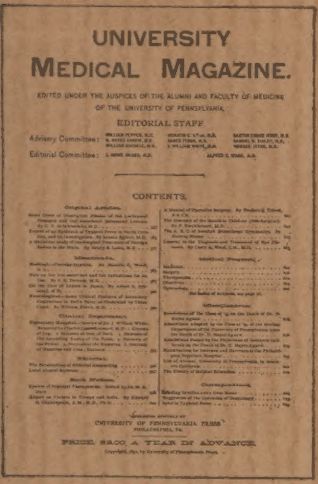
ALLEN (H.)

REPRINTED FROM



UNIVERSITY
MEDICAL MAGAZINE.

EDITED UNDER THE AUSPICES OF THE ALUMNI AND FACULTY OF MEDICINE OF THE UNIVERSITY OF PENNSYLVANIA.

EDITORIAL STAFF

Advisory Committee:

Editorial Committee:

CONTENTS.

UNIVERSITY OF PENNSYLVANIA PRESS
PHILADELPHIA, PA.

PRICE, [illegible], A YEAR IN ADVANCE.

DECEMBER, 1893

COMPLIMENT
DR. HARRISON AL
1933 CHESTNUT STREE
PHILADA., PA

THE ETIOLOGY OF FRACTURE OF THE LOWER END OF THE RADIUS.

By HARRISON ALLEN, M.D.,
Of Philadelphia.

THE ETIOLOGY OF FRACTURE OF THE LOWER END OF THE RADIUS.[1]

By Harrison Allen, M.D.,
Of Philadelphia.

I DESIRE to call attention to one of the most common of the fractures of the long bones.

As illustrated by R. W. Smith,[2] the fracture is usually the result of a fall upon the palm, and is liable to happen whenever a person, in the act of falling forward, throws out before him his arms and hands in a state of extension, which he does, as it were, instinctively to save the head and face from injury.

Mr. W. H. Flower[3] states that the hands are generally thrown forward, the whole weight of the body being received on the palmar aspect.

Mr. Erichsen[4] believes that when a person falls on the palm of the hand, the shock is principally received on the ball of the thumb and on the radial side of the wrist. He follows this statement with another which is less explicit, namely, that the force of the shock impinges from without inward,[5] since the figure that accompanies the descriptions[6] shows, as is always the case, the radius to be greatly deformed on the side which answers to the thumb.

Numerous other expressions could be cited in support of the assumption that the accident is the result of a fall upon the palm or the ball of the thumb. I have recently concluded that the terms of such a proposition are given in a manner too general to be satisfactory, and are in part erroneous.

I believe that when the arm is thrown in front of the body, as in the act of falling, the impress is received upon that part of the palm

---

[1] This paper is printed at this time with the object in view of soliciting observations from surgeons. I would be greatly pleased if the following facts could be carefully noted: (1) The positions of discolorations and bruises of the hand—whether on the little finger or thumb side (2) the positions of discolorations and bruises of the fore-arm—whether on the ulnar side or flexor surface; (3) the parts of the sleeve that have been soiled or torn by being brought in contact with the ground—whether on the little finger side or across the front of the lower part of the sleeve.—H. A.

[2] A Treatise on Fractures in the Vicinity of Joints, etc., Dublin, 1847, p. 134.

[3] Holmes' Surgery, Vol. II, p. 552.

[4] The Science and Art of Surgery, 1873, p. 361.

[5] The position of the hand here evidently is that with the thumb directed outward, the thumb being on the outer side, as in the attitude of a soldier standing at attention, while the little finger is on the inner side.

[6] Ibid, p. 360.

answering to the little finger, and not upon the palm as a whole, or upon the ball of the thumb. I venture upon this statement with some hesitation, since it is almost impossible to prove the assumption either by observation or the statements of patients, and analogy is not always a good guide. Nevertheless, in this case it may form the basis of an improved statement of facts.

The only authority that I can refer to in this connection is that of A. Gordon,[1] whose language is as follows: "An engineering student, while skating, fell sideways and fractured the right radius at about one-half inch from the lower end behind. He obstinately claimed[2] that the extremity, at the moment of the accident, was not much extended, and that the whole shock was received upon the inner (*i. e.*, little finger side) and upper part of the palm." Mr. Gordon does not draw valid conclusions from this, for in the experiments upon which he based his subsequent statements, he speaks of seizing the hand of the subject and bending it backward, by which means he succeeded in breaking the radius; but it is evident from the manner in which the palm of the hand had come to the ground in the instance given, it could not have been bent forcibly backward, but pushed toward the thumb side of the hand as well as backward. It is always necessary to remember that when the hand is prone the thumb side becomes "inner" and the little finger side "outer."

I have been led to believe that the extended hand of man comes to the ground as does the fore-foot of the quadruped. The foot of such a limb, when in advance of the body, is always extended, and, as it is prepared to approach the ground, is held in a position midway between pronation and supination. As it reaches the ground and is prepared to support the body the foot strikes along or near the outer (little finger) border. The entire foot does not receive the weight of the body until it is brought well beneath it. In a word, during the first stage of support the line of impact is from the outer border to the centre of the foot. When a person falls forward (as Mr. Smith expresses it), the arm is instinctively thrown in front of the body. Many, if not all, instinctive actions are of ancestral origin, and it is difficult to believe that this inherited motion in the human subject is different in kind from that habitually employed by the quadruped.[3]

In a normal state of affairs, such as exists in the act of crawling, the force of the impact would gradually be distributed through the

---

[1] A Treatise on Fractures of the Lower End of the Radius, etc., London, 1875, p. 12.

[2] It is to be inferred that the patient had been subjected to a sharp examination, since his statement was held to be improbable.

[3] See in this connection a report of a lecture by myself, entitled "On the mechanism of the Mammalian Limb." The lecture was delivered under the auspices of the Academy of Natural Sciences of Philadelphia, February 19, 1892, and was printed in *Boston Medical and Surgical Journal*, March 7, 1892.

entire hand, and no injury would occur to any of its parts. But a lesion, resulting from a forcible and injurious impact of the hand upon the ground, is not followed by any of the later stages of evolution of the hand in supporting the body.

A number of the specimens of the fracture in the Mütter Museum of the College of Physicians of Philadelphia, which I have recently examined, clearly show that the several parts relate to the lines of forces acting as already indicated. It is not necessary to enter into a minute description of these specimens, for the anatomy of the fracture has been so frequently described that little or nothing can be added to the subject.

What takes place then in the fracture at the lower end of the radius as a result of falling with an extended fore-arm thrown in front of the body? The action can be formulated thus: As a result of violent contact of the hypothenar portion of the palm against the ground, the hand is first pressed upward (not backward)—that is to say in a direction as though the forces were exerted on the hypothenar side of the palm and were to traverse the palm to the thenar side; and the direction is upward since the hand is midway between pronation and supination. Secondly, the force of the impact is measurably transferred to the centre of the palm obliquely inward and backward. The act of a violent and unexpected fall throws the entire weight of the body upon the unrelieved hand, with the result of wrenching the hand inward and upward from the hypothenar side and impacting the radius against the carpus. In this fashion are created all the several lines of lesion.

It is only necessary to remember that fractures occur at the lower end of the radius in a variety of ways, Since the specimens in our museums are rarely accompanied with clinical histories, it becomes a difficult matter to separate the classes of injury. All the specimens which I have examined, however, closely resemble one another, and appear to have been produced by a simple fall forward to the ground. L. S. Pilcher[1] has made a careful study of the fractures of the inferior extremity of the radius, and defines four varieties of accidents which can create them:

First, falls upon the palm of the hand; common; second, simple over-extension of the hand; unfrequent; third, falls upon the back of the hand; rare; fourth, simple over-flexion of the hand; very rare.

The above note comes within the limit of the first of these groupings. It is held to be a gain in describing this common fracture to substitute the phrase "fall upon the hypothenar portion of the hand," for the phrase "fall upon the palm of the hand and the ball of the thumb."

---

[1] Proc. of the Med. Soc. of Kings County, Brooklyn, N. Y., 1880, p. 159.